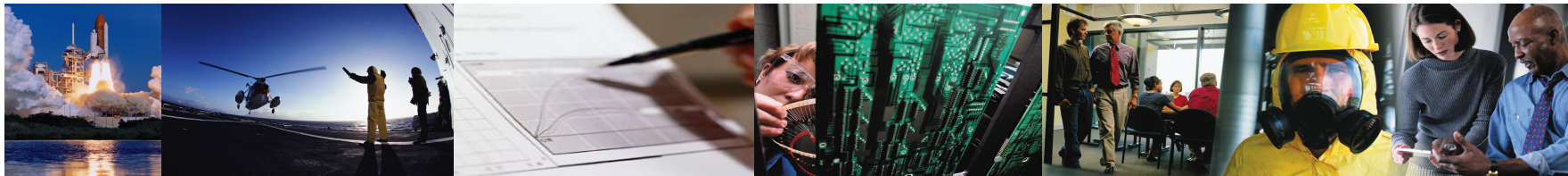




NASA RAP & P2 Meeting
NASA Ames Research Center
Moffett Field, CA
May 24-26, 2005

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NASA AP2 Projects Review

NASA Portable Laser Coating Removal System

Description:

- Follow-on from JG-PP PLCRS project, to look at new application areas for use within NASA.
- Determined NASA's need for alternative method of stripping coatings on Shuttle, GSE and Structural Steel.

Stakeholders:

- NASA KSC (USA, Boeing) and GRC

Benefits:

- Follow-on from JG-PP project, so no duplication
- Decreased hazardous waste generation & cost
- Reduced labor costs



Courtesy: Quantel SA, France

Nd: YAG Laser



Courtesy: Laserline, Germany

Diode Laser

FY 04 Achievements:

- Located stakeholders within OEM's, Contractors and NASA to move forward with a follow-on to the JG-PP PLCRS Project.
- Contingent of technical reps from KSC and GRC viewed demonstration of 3 portable laser systems at Wright-Patterson AFB (Aug. 2004)
- Submitted for IES funding of a Laser / Liquid Nitrogen Stripping Study
- Developing test protocols and requirements

Future Plans:

- Demonstrate / Validate for use on Shuttle tile-cavity and for use in GSE within NASA
- Demonstrate / Validate for use on Structural Steel / Weld applications
- Select and optimize a laser for use in these types of applications, perform feasibility trials
- Develop a Test Report and Implementation Plan for use of similar systems across NASA Centers for small-scale stripping applications



Parts Washer Alternatives

Description:

- AP2 office identified the need for environmentally preferable parts washers during PPONAs.
- Scope includes testing select parts washers that meet performance guidelines set by stakeholders and developing a 'Consumer's Guide'.
- Will include comparative analysis of some current parts washers used at NASA Facilities.

Stakeholders:

- KSC, MSFC, MAF, WFF, GRC, LaRC, JPL, SSC, WSTF, GSFC and ARC.



Benefits:

- Reduced costs associated with Hazardous Materials and Waste handling.
- Eliminate or reduce the EHS footprint of this process throughout NASA Centers.
- Cleaning efficiency tests adds 10 weeks to schedule, but gain more quantitative evaluation
- Stakeholders now see benefit of collaborative projects

FY 04 Achievements:

- Determined the deliverable most desired for stakeholders is a 'Consumer's Guide'.
- Surveyed Centers on current parts washers
- Began development of performance guidelines and benchmarks that will be covered in the guide.

Future Plans:

- Demonstrate parts washers at four NASA Centers
- Conduct testing at Rochester Institute of Technology on 30+ chemistries
- Prepare report in the form of a guidance document for selecting alternative parts washers



Low Emission Depainting on Steel (NASA-AFSPC)

Description:

- Goal is to validate alternative Low Emission Surface Preparation/Depainting technologies for Structural Steel
- Current methods involve high-dusting abrasive blasting
- Applicable Regs.: OSHA, NIOSH, ACGIH

Stakeholders:

- Kennedy Space Center, Stennis Space Center, Air Force Space Command



Benefits:

- Improved corrosion protection of critical systems
- Easier, less costly maintenance, reduced flight hardware contamination, and reduced haz. waste
- Reduced costs associated with current maintenance activities across NASA
- Forecasted 4:1 return on NASA investment through FY 06

FY 04 Achievements:

- Identified key stakeholders and benefits.
- Phase 1 project funding obtained
- Distributed PAR, JTP and Field Test Plan
- Began penning CBA
- Procured materials and prepared coupons for testing

Future Plans:

- Initiate first stages of field and laboratory testing
- Initiate first stage of field evaluations

Alternatives to Aliphatic Isocyanate Urethanes

Description:

- Goal is to validate alternatives to isocyanate urethanes
- Currently isocyanate urethanes are used across NASA on structural and non-structural elements in both shuttle and non-shuttle programs
- Applicable Regs.: OSHA, NIOSH, ACGIH

Stakeholders:

- Kennedy Space Center, Stennis Space Center, Air Force Space Command



Benefits:

- Eliminates environmental, safety, and health concerns with use of isocyanate urethanes
- Forecasted 1.8:1 return on NASA's investment through FY 06

FY 04 Achievements:

- Identified key stakeholders and benefits (KSC, SSC, AFSPC)
- Distributed PAR JTP and Field Test Plan
- Began penning CBA
- Procured materials and prepared coupons for testing

Future Plans:

- Initiate first stages of field and laboratory testing (Began March 2005)
- AFSPC to provide \$110K funding



Alternatives to High-VOC/Chrome-containing Coatings for Portuguese Aircraft Exteriors

Objective: Demonstrate low-VOC and non-chrome coatings (pretreatment-primer-topcoat) on Portuguese commercial aircraft.

Justification: Few aerospace systems have switched to entire chrome-free and VOC-free coating system. The identification/qualification of hex-chrome free coating systems is a Portuguese priority due to national & European safety and environmental regulations.

Accomplishments:

- Team formed: TAP Air Portugal, OGMA – Indústria Aeronáutica de Portugal, C3P & NASA AP2.
- Painted exterior service door of a TAP Airbus A319 and dip-applied non-chrome pretreatment on several panels (Oct. 2004).

Future Plans:

- Monitor coatings' performance during flight testing and analyze data from Salt Spray Test (Corrosion Resistance Test) coupons
- Seek to migrate technology to other aircraft, including Portuguese Air Force





Removal of VOCs from Air Streams using Membrane Technologies (Project Opportunity)

Proposed Objective: Demonstrate the feasibility of a membrane unit for removing VOCs from one or more contaminated process air streams (e.g., remediation, paint booth, solvent cleaning, metal finishing, solvent recycling).

Justification: Technology is near to COTS stage, very new and promising for several types of air contaminants.

History:

- Prototype membrane technology demonstrated on paint booth at KSC.
- Presentation at NASA AP2 Sep. 2004 Int'l P2 Workshop garnered interest from technical reps from KSC, Wallops, & C3P.

Future Plans:

- Develop performance requirements
- Solidify Stakeholders
- NASA AP2 developing project scope (identification of air streams & contaminants)
- Seeking ESTCP Funding for 2006





Enhanced Coatings for Space Launch Applications (Project Opportunity)

Proposed Objective: Demonstrate coating(s) for NASA facilities and Shuttle operations, AF Space Command Range & Space Lift Operations, and AF weapons system maintenance

Justification: New coatings on the market (e.g., Kimetsan D45 and Zinga) hold promise for providing long-lasting protection for structures and facilities.

History:

- Presentation at NASA AP2 Sep. 2004 Int'l P2 Workshop
- Garnered interest from technical reps from KSC (Shuttle), Patrick AFB, 45th Space Wing, Vandenberg AFB, AF Space Command, Hill AFB, and Malmstrom AFB

Future Plans:

- NASA AP2 developing project scope
- Identify applications & performance requirements
- Determine all potential alternatives
- Solidify stakeholders



Alternatives to High-VOC/Chrome-containing Coatings for Commercial Aircraft Exteriors

Coating system application (spray)

Two coating systems were applied to the door of an Airbus A319 in the following manner

- Upper half:

+ High Solids AZCO NOBEL painting scheme:

M790E, for surface preparation

Aviox CF Primer

Aviox Finish 77702

- Lower Half: Pantheon Chemical Conversion Coating

+ High Solids AZCO NOBEL painting scheme:

PreKote Chemical Pretreatment

Aviox CF Primer

Aviox Finish 77702

Coating system application (dip)

The project team also conducted dip application testing (plating shop) at TAP's facility. The intention here was to assess the processing requirements of the PreKote system, as well as to prepare some test panels for laboratory testing (e.g. filiform and salt spray corrosion testing).



PreKote scrubdown and foaming

Future actions:

Application and flight testing of the PreKote aluminum pretreatment on a military aircraft is anticipated sometime in 2005 under the auspices of the Portuguese Air Force. The availability of a PoAF C130 or F16 is currently under review.

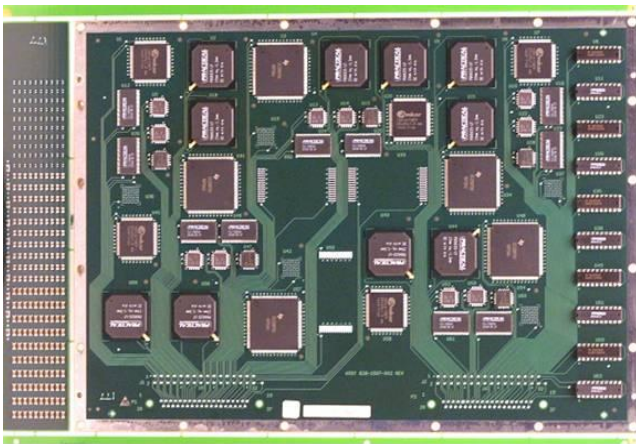
Lead-Free Solder Project (NASA-Aging Aircraft)

Description:

- Joint DoD-NASA-OEM project to provide baseline data to allow eventual qualification and validation of lead-free solder alloys for use in manufacture and repair of electronic equipment
- Consumer electronics are driving commercial market to lead-free alternatives

Stakeholders:

- NASA KSC, JPL, MSFC, JSC, GSFC, ARC, USA-SRB, Boeing-Orbiter
- Air Force, Army, Navy, Marines, Dept. of Energy
- More than 25 manufacturers and vendors



Benefits:

- Estimated 5-to-1 return for NASA (\$600K NASA investment in \$3M project)
- NASA AP2 becoming focal point for new Agency, DoD, and International lead-free solder initiatives
- JTP meets NASA core testing needs (confirmed buy-in from NASA MSFC, Boeing/Orbiter, JPL)

FY 04 Achievements:

- Materials procurement and testing fully funded
- Test vehicle build completed. Soldered 75,513 components onto 205 boards
- All testing began in Aug. 2004.
- No conclusions yet, but expected by 2Q 2005.

Future Plans:

- Complete testing
- Analyze data and prepare Joint Test Report
- Close this “Phase 1” project in FY 05
- Develop implementation plans and/or need for future work (“Phase 2”)
- Summit in July (ACI)



Lead Free Solder - Business case for communication & coordination across NASA

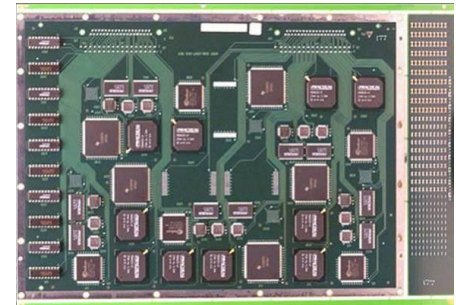
LFS Issues: As electronics manufacturers continue the transition to lead-free, NASA must fully understand the risks associated with lead-free solders in aerospace applications. NASA faces major challenges associated with lead-free including tin whisker formation, lead-free solder reliability and intermetallic contamination between lead and lead-free solder alloys created during rework procedures.

Problem: It is not clear how aware NASA Headquarters is of the issues and risks that LFS creates. The NASA AP2 Office was unable to confirm who within NASA Headquarters has been briefed on the issues. Currently there are two separate focus areas being addressed within NASA: tin whisker (GSFC) and LFS (MSFC).

AP2 Activities: The NASA AP2 Office has been in contact with GSFC, MSFC, and JPL to discuss the issues associated with LFS.

Proposed Solutions: An effort should be made to coordinate LFS work across NASA bringing the primary centers together. Once organized the following efforts need to be accomplished:

- Brief the Office of Chief Engineer
- Brief the 4 NASA Mission areas: Exploration Systems, Space Operations, Science and Aeronautics Research



Lead-free Solder Body of Knowledge (Support to MSFC)

Description:

- Summarize lead-free test data (relative to space environments), analyze risks to NASA, and recommend mitigation strategies

Stakeholders:

- NASA-MSFC

Benefits:

- Will recommend future lead-free testing with technical justification included.
- Will identify risks to NASA of both the commercial lead-free transition and the possibility of converting to lead-free solder alloys.



FY 04 Achievements:

- Established numerous points of contact with regards to reliability studies. A table is being generated to track all of the POCs and resources being utilized for this effort.
- As of December 2004 the list contains 80 POCs among 67 organizations or companies of which 21 have already been contacted for a request of high-performance, high-reliability study information.

Future Plans:

- Continue to identify articles and studies that relate to LFS testing of high-performance electronics and make contact with companies or persons involved with those publications
- Review the POCs and resources tracking table and follow-up by phone and email where deemed necessary



Fire Suppression Replacement (Developing)

Proposed Objective: Test the fire extinguishing capabilities of a novel dry chemical agent that could be employed where halons and other agents are currently used and water cannot be used.

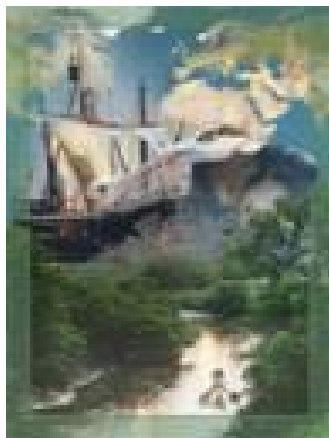
Justification: Halon has been classified as an Ozone Depleting Substance (ODS) and manufacture of the material was banned in the U.S. in 1993. Suitable alternatives have not been found for many applications, including the Shuttle. Other existing dry chemical agents can cause breathing difficulties and reduced visibility.

History: The material was developed at the NASA Applied Technology Branch at KSC. Small amounts of the material was developed and underwent initial testing at the University of Virginia.

Stakeholders: Garnered interest from technical reps from KSC (Shuttle), Tyndall AFB, Patrick AFB, 45th Space Wing, Vandenberg AFB, AF Space Command, Hill AFB, Malmstrom AFB, and the Federal Aviation Administration (FAA).

Future Plans:

- Conduct larger scale testing for “Streaming Agent” and “Total Flood” uses, as well as a Toxicological Analysis, must be performed
- AFRL Fire Research Branch at Tyndall AFB has the capabilities to perform these tests and has volunteered to conduct initial capability testing on small 2B and 5B fires
- The FAA has volunteered to conduct a Full Scale Cargo Bay Mock-Up test



INTERNATIONAL POLLUTION PREVENTION WORKSHOP

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The Portuguese Center for Pollution Prevention is holding an International Pollution Prevention Workshop on September 8-9, 2005 in Lisbon, Portugal.

An exciting program is being planned that will include presentations, informal discussions and demonstrations on the following technical topics (and more):
Surface Treatment Technologies, Paints & Coating Technologies, Depainting, Industrial Cleaning, Green Electronics, Etc.

This workshop will be geared toward materials and process engineers from the Europe, United States, and elsewhere affiliated with government agencies as well as large and small businesses.

For more information please visit: <http://www.c3p.org>



Contact Information

NASA AP2 Website:

<http://www.acqp2.nasa.gov/>



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